# THE DEVONIAN TABULATA OF DOUGLAS AND DRUMMOND CREEKS, CLERMONT, QUEENSLAND.

By O. A. Jones, M.Sc. (Cantab. and Qld.), Department of Geology, University of Queensland.

(Plates I.-III.)

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SUMMARY:

This paper is a companion to a paper on the Rugose corals of this district published by Dr. Dorothy Hill in the Proceedings of the Society in 1939. It describes the Tabulate Corals collected by her and those in the collection of the Geological Survey of Queensland. The following genera and species are recorded and described:—



*Thamnopora meridionalis* (Etheridge) although not occurring in the area is redescribed (p. 46) to facilitate the description of the new variety. The species of *Scoliopora* is the first record of that genus for Australia and *Gephuropora duni* is recorded for the first time from Queensland.

*Age of the Limestones:* Dr. Hill in her paper gave a summary of the previous work to which account the reader is referred, and determined the age by the *Rugosa* to be Lower Middle Devonian and probably the upper part of the Lower Middle Devonian, i.e. Upper Couvinian.

All the species of Tabulata are purely Australian. *Favosites bryani* occurs in the Receptaculites Limestone at Yass, which is fairly high in the Couvinian, and in the probably Lower Devonian Garra beds near Molong. *F. nitidus* occurs at Deep Creek and Cooper's Creek, Walhalla, Victoria, which is Upper Silurian [? Devonian]. *Alveolites suborbicularis* occurs throughout the Devonian of Europe. *Thamnopora meridionalis* var. *minor* is close to *T. meridionalis* from the Upper Middle

Devonian Burdekin beds and is also close to an undescribed species from the Middle Devonian of Buchan, Victoria. *Thamnopora foliata* occurs in the Couvinian of Silverwood, Queensland, *Striatopora? hillæ* and *Striatopora? plumosa* are not closely comparable with any described species and though in size of the coralla they approach the Upper Silurian *S. halli,* little weight can be placed on such a comparison. *Gephuropora duni* occurs in the Bluff limestone (base of Couvinian) and the Currajong limestone (400 feet above the Bluff) at Taemas, N.S.W., and also in the Middle Devonian of Buchan, Victoria. Of the European species of *Gephuropora* described by Lecompte it is closest to *G. mailleuxi* which occurs in the middle and upper part of the Couvinian *Scoliopora flexa* is not clearly comparable with any described species, but species of this genus occur in the Givetian and Frasnian of Belgium and in the Devonian of Germany. *Syringopora spelaeanus* occurs in the Couvinian of Wee Jasper, N.S.W. and *S. eifelensis,* which it closely resembles occurs in the Upper Couvinian and Lower Givetian of Europe.

The age then is clearly Couvinian but it is difficult to place it more closely, as only one of the species, *Alveolites suborbicularis,* occurs outside Australia. But the relationship of *Gephuropora duni* and *Syringopora spelaeanus* with European species together with the general assemblage suggest it to be the upper part of the Couvinian. This is in agreement with Dr. Hill's determination based on the Rugosa.

## MADREPORARIA TABULATA.

### Family Favositidae.

### Genus Favosites Lamarck.

*Favosites* Lamarck 1816, p. 204; Smith and Gullick, 1925, p. 117; Jones, 1936, p. 2.

*Genotype: F. gothlandicus,* Lamarck, 1816, p. 205. Silurian of Gotland.

### Favosites bryani Jones.

Pl. I, Fig. 1.

*Favosites bryani* Jones 1937; pp. 96, 97; pl. xv. figs. 3-6.
*Favosites bryani* Hill and Jones 1940; p. 190; pl. v, figs. 2a, 2b.

*Holotype:* (by original designation). The specimen in the Australian Museum F. 5550 from the Middle Devonian of Good Hope, Yass, N.S.W.

*Diagnosis: Favosites* with small moderately thick walled polyhedric corallites, long, slender, sharply pointed septal spines, one row of circular mural pores, and fairly numerous tabulae, which are mostly complete.

*Description of Clermont Specimens:* All consist of fragments of colonies—flat pieces of small thickness, probably exfoliation flakes, so that the external form is unknown. The corallites have a diameter of 1 to 1·25 mm., the walls are moderately thick; long sharply pointed septal spines show in the longitudinal section. The mural pores have been observed in only one place where they are in two rows. The tabulae are numerous, mostly complete some incomplete and inosculating about 15 in a space of 5 mm.

*Remarks:* The Clermont specimens agree well with the holotype and other Taemas material except that in the Clermont specimens the mural pores in the only place where they can be seen are in two rows. In the Taemas material they are usually in one row but occasionally in two.

*Locality:* Douglas Creek, Clermont (Univ. of Q. collection, F. 3964) and probably Geol. Surv. of Q. collection, 66. F. 3965-6 (Univ. of Q. collection) are placed in this species on macroscopic characters.

### Favosites nitidus Chapman.

Pl. I, Fig. 2.

*Favosites nitida* Chapman 1914, p. 309, pl. liv, figs. 21-23; pl. lv, figs. 24, 25.

*Favosites nitida* Jones, 1937, p. 93, pl. xiii, figs. 4, 5.

*Favosites nitidus* Hill & Jones, 1940, p. 198, pl. vi, figs. 3a-c.

*Diagnosis: Favosites* with small, erect polyhedric corallites, blunt septal spines which are very irregularly distributed and may be entirely absent in parts of the corallum, one row of large circular mural pores and fairly numerous complete tabulae.

*Remarks:* Two specimens from Clermont are quite typical of the species. Septal spines are numerous. A third badly preserved specimen is doubtfully included.

*Locality:* South Limestone belt, Clermont, Por. 73, Par. Copperfield (F. 3967, F. 3968 University of Queensland Collection, collected by D. Hill). The doubtful specimen is in the Geological Survey of Queensland Collection, No. 21, and is from Douglas Creek, Clermont. F. 3969-81 (Univ. of Q. collection) are placed in this species on macroscopic characters.

### Genus Alveolites Lamarck.

*Alveolites* Lamarck, 1801, p. 375.
*Alveolites* Smith, 1933, p. 135.
*Alveolites* Lecompte, 1933, p. 7; 1939, p. 17.
*Alveolites* Hill, 1936, p. 33.

*Genolectotype: Alveolites suborbicularis* Lamarck, 1801, p. 376. Upper Devonian, Frasnian. Near Dusseldorf, Germany. See Smith 1933, p. 135.

*Diagnosis:* Massive, ramose or encrusting Tabulate corals, frequently growing in superimposed layers. The corallites grow out horizontally from one or more centres or diverge from an axis. Usually the corallites are small, semilunular or sub-triangular in section; they are more or less compressed, and open to the surface by oblique calices, each with lower lip projecting. The wall may be thin or dilated; the septa when present are represented by spines. The tabulae are complete and thin, and the mural pores are wide and distant. (Emended from S. Smith, 1933, p. 135.)

*Remarks:* The genus *Alveolites* has recently been discussed by Lecompte 1933, 1939; Smith 1933, and Hill 1936. Lecompte dealing with a wealth of material has described the variation in each species and Miss Hill has made the first observations on the microscopic structure of the skeleton, basing these on material from the Eifel and Western Australia.

My observations on the single specimen from Clermont confirm that the fibres of the wall diverge from the "median dark line" which is median or almost so in those corallites which are more erect and sub-polygonal in section, and commonly sub-median in those which are reclined and semilunar in section. But contrary to Miss Hill's observations on the Eifel material, when sub-median it is more commonly nearer to the upper surface of the wall, though frequently nearer to the lower surface. My observations on a specimen from Torquay are similar. The fibres cannot be seen in longitudinal section nor can the structure of the septal spines. In the Clermont specimen the wall where cut tangentially shows in two places hints of the streaky appearance described below (p. 52) and thought to be due to the septa having exceedingly short lamellar bases, but it cannot be regarded as certain.

ALVEOLITES SUBORBICULARIS Lamarck.

Pl. I, fig. 3.

*Alveolites suborbicularis* Lamarck, 1801, p. 376.

*Alveolites suborbicularis* Smith, 1933, pp. 137-138.

*Alveolites suborbicularis* Lecompte, 1933, pp. 15-25; 1936, pp. 6-9; 1939, pp. 19-22.

*Alveolites suborbicularis* Hill, 1939 (b), p. 145.

*Neotype:* (chosen by Smith, 1933, p. 138). The original of *Calamopora spongites* var. *tuberosa* Goldfuss, 1829, pl. xxviii, figs. 1a-b; Upper Devonian of Bensberg, near Cologne, in the Goldfuss Collection, Bonn University. (Lecompte 1936, p. 7 and pl. 1, fig. 1a, described and figured this specimen as the original of fig. 1d of Goldfuss; it is clearly the same specimen as cited by Smith since Lecompte's fig. 1a, pl. 1 is identical with Smith's figs. 1 and 2, pl. 11).

*Diagnosis: Alveolites* whose small corallites have thick or thin walls and are semi-lunar, sub-triangular or rarely sub-polygonal in section; septal spines absent or represented in some corallites by a a vertical row of strong spines or by a number of rows of small spines; mural pores uniserial, confined to the small sides of the corallites. (Based on Smith, Hill and Lecompte).

*Description of the Clermont Specimen:* The corallum is encrusting on a colony of *Gephuropora* and is 6 cm. by 6 cm. by 2 cm. high. The corallites diverge from a number of centres. The corallites are almost all reclined and in section are semi-lunar, rarely sub-triangular or sub-polygonal, 0·6-0·9 mm. in their longer and 0·6-0·5 in their shorter direction. The dilatation of the walls varies in different parts of the corallum, in places it is considerable (0·3 mm.) in other places slight (0·1 mm.). Septal spines are developed irregularly, some corallites showing none at the level of the sections, others as many as five; the spines are short and rather thick, single strong spines not observed.

The mural pores are uniserial, usually at the lower angles of the corallites, of the order of size of 0·15 mm. diameter. The tabulae are not numerous, very irregularly distributed, as far apart as 2 mm. and as close as 0·2 mm.; they are complete, most usually horizontal but frequently inclined.

*Remarks:* Lecompte (1939, pp. 9-16) has made a valuable study of variation in species of Tabulate corals and indicates the limits of variation he considers permissible in a species. In the same work

(pp. 22-23) he divides *A. suborbicularis* into three *formae* on the type of corallum. Accepting this division into formae the specimen described above would be placed in forma *gemmans* (p. 22, pl. 1, figs. 1-12). Whether this division into formae can be applied to Australian material must await further collection and examination.

In size of corallites the Clermont specimen is slightly smaller than the holotype, but Lecompte (1933) studying a wide range of material gave 12 to 17 corallites in a distance of 10 mm. in a longitudinal direction and about 20 in a transverse direction. Smith, studying the syntypes, concluded that septa are represented by one vertical row of spines, but Lecompte, studying both syntypes and other material, concluded that they are represented by small granular spines in vertical rows but that the median spine on the lower face is often larger than the others which do not appear in all corallites of any one section.

In the Clermont specimen the septal spines appear most frequently as dots (cross sections) in the longitudinal section, although they are present in several corallites in the transverse section. I was in some doubt whether these dots and projections were spines or due to recrystallisation, but in some the yellowish tinge characteristic of dead coral tissue can be observed, so that some if not all are spines. The most observed in one corallite in transverse section was five while Lecompte observed as many as eight in a paratype (1936, p. 8).

The number of tabulae varies greatly both in different specimens and in different parts of the same specimen. For the holotype Smith says they are less than 0·5 mm. apart. Lecompte says usually 25 in 10 mm., but that he observed up to 4 in a mm. in which case they were very regularly spaced. This then is a point in which the Clermont specimen differs from the European material for in it the tabulae are very irregularly spaced, varying from 2 mm. apart to 0·2 mm. apart.

*Locality:* Por. 73, Par. Copperfield, Clermont, Queensland (Univ. of Q. coll. F. 3959).

## Genus Thamnopora Steininger.

*Thamnopora* Steininger, 1831, p. 10.
*Pachypora* Lindstrom, 1874, p. 14.
*Thamnopora* Hill, 1937, p. 56.

*Genotype: Alveolites cervicornis* de Blainville, 1830, p. 370, Middle Devonian, Eifel.

*Diagnosis:* Ramose or laminar Tabulate corals in which the cylindrical branches may be flattened and coalesced, the corallites are typically polygonal, and diverge from the axis of the branch and usually open normally to the surface; the corallite walls are dilated throughout, and the dilatation increases distally, typically the growth lamination in the sclerenchyme of the wall is obvious, while its fibrous nature is not; septal spines may or not be present and mural pores are usually large. (Emended from Hill 1937, p. 56.)

*Remarks:* For synonomy and genolectotype see Hill, 1937, p. 56. Lindstrom, 1874, founded the genus *Pachypora* for a Silurian species, *P. lamellicornis* from Visby, Gotland. Later writers put other species including *Alveolites cervicornis* de Blainville, the genotype of *Thamnopora* in this genus. Lindstrom, 1896, disagreed with them stating that the structure of the sclerenchyme in *Pachypora* was essentially different

from that in other genera of the Favositidae. Hill, 1937, regarded *Pachypora* as a synonym of *Thamnopora,* observing that the growth lamination obscured the fibrous nature of the walls. Lecompte, 1936 pp. 9-34, examined the type of "*Favosites*" *cervicornis* (which afterwards in 1939, he referred to *Thamnopora*) and specimens of Lindstrom's own material of *P. lamellicornis.* He figured thin sections of the walls of both, some highly magnified, and discussed the wall structure in detail. He concluded, p. 30, that probably *Pachypora* is distinct from *Thamnopora* on the basis that the structure of the sclerenchyme in *Thamnopora* is a layer with a structure "en barbes de plumes," i.e., like the feathers of a quill, and another layer with a radiating fibrous structure, while the structure in *Pachypora* is finely laminated concentric to the calices.

I have had the opportunity of examining only a few sections of *T. cervicornis* but after careful study of Lecompte's reasoning and of his excellent plates and study of thin sections of topotypes of *P. lamellicornis* I am of the opinoin that there is no essential difference between the structure of the two genera, that while the structure in *P. lamellicornis* is finer than in *T. cervicornis* both are produced by recrystallisation making the growth laminae more conspicuous than the fibrous trabecular structure, and that this suppression of the fibrous structure has proceeded further in *P. lamellicornis.* This is the interpretation expressed by Miss Hill, 1937, p. 56, and in correspondence with M. Lecompte but is not accepted by the latter.

An important paper by Bryan and Hill, 1941, shows this interpretation to be correct. They show that in Hexacorals the mechanism of growth is spherulitic, each trabecula of the vertical skeletal elements and each horizontal element being a spherulite, plumose and pilose aggregates respectively. They point out, further, that while the skeleton of the Rugosa, the Tabulata and Heliolitida are calcite and were presumably deposited as calcite (not aragonite as in the Hexacorals) they are fibrous and their septa trabeculate and thus it may safely be assumed by analogy that their skeletons were produced by spherulitic crystallisation. Two types of concentric lamellar banding, which interrupt the fibres, were observed by them in Hexacorals, the larger, more conspicuous and less regular of which they consider due to irregular growth of the organism, and the smaller, more delicate and remarkably regular alternations as due to rhythmic deposition of skeletal material, the rhythm being induced by alternate periods of quiescence and active feeding during the hours of daylight and darkness.

Thus *Thamnopora* must originally have had a fibrous structure in common with the rest of the Tabulata, and it is easy to understand that recrystallisation would obscure that structure so that the rhythmic lamination would be relatively more prominent.

At Clermont two species of *Thamnopora* occur. One of these is close to *T. meridionalis* (Nicholson and Etheridge). As no description of the latter has appeared since 1892 and as I have had the opportunity of examining some of Etheridge's original material, the species is redescribed and figured here:

THAMNOPORA MERIDIONALIS (Nicholson and Etheridge).
Pl. I, figs. 4-6.

*Pachypora meridionalis* Nicholson and Etheridge 1879, p. 280, pl. xiv, figs. 4-4c. Etheridge 1892, p. 51, pl. 2, figs. 10-15.

*Syntypes:* Nicholson and Etheridge's syntypes are in the British Museum (Natural History) Nos. 90239a, b, 90241 and are unobtainable at the present time owing to the European war. The species is interpreted here on specimens which were figured with the syntypes by Etheridge, 1892, on other specimens named by Etheridge, and additional material from Burdekin Downs. These specimens are in the collection of the Geological Survey of Queensland, F. 1645 (Etheridge fig. 15), F. 1651 (fig. 14), $D_3$ and $D_6$ (sections only) and in the collection of the University of Queensland. Another specimen apparently named by Etheridge is labelled $D_3$ but is not the one from which the section $D_3$ was cut. It is excluded from *T. meridionalis* as it is a much larger form.

*Diagnosis: Thamnopora* branching dichotomously at distant intervals, with small corallites, no septa, few but large mural pores and few but complete tabulae.

*Description of Etheridge's Specimens:* The two figured specimens differ in the diameter of the branches, one being 2 mm., the other 8 mm. All the coralla are embedded in limestone. Dichotonous branching can be observed in one place. The sections show the diameter of the corallites to be about 0·5 mm. in the axial region, increasing rapidly when the corallites diverge towards the surface of the coralla, to reach a diameter of 0·75 mm. at the calices. The diameter of the calices is greatly reduced by thickening and their original polygonal outline is not always discernible. The calices are only slightly oblique, opening almost at right angles to the surface. The corallite walls are thickened throughout, slightly in the axial region, but the thickening increases rapidly towards the calices. Septa are absent. Mural pores are rare and apparently irregularly disposed. They are placed in the walls of the corallites, are circular and large. The tabulae are few, irregularly distributed, thin, complete, sometimes 0·5 mm. apart.

*Remarks:* Nicholson and Etheridge record this species from the Fanning River, Burdekin Downs, Arthur's Creek (Burdekin Downs), and Regan's, Northern Railway; Middle Devonian. A variety (described below) occurs at Clermont.

*T. meridionalis* is very close to *T.* (*?*) *vermicularis* (McCoy) as described and figured by Lecompte 1939. In the latter, however, the calices are smaller and very oblique, characters in which the Clermont variety resembles it more closely. *T. meridionalis* is smaller than *T. dubia* (de Blainville).

THAMNOPORA MERIDIONALIS: (Nicholson and Etheridge).

var MINOR var. nov.

Pl. I, figs. 7.

This variety differs from *T. meridionalis* in branching more frequently; the average diameter of the branches appears smaller, some being as small as 1·5 mm., while the largest observed is 6 mm. wide and 2 mm. thick, but about 2 mm. is the most usual; branches are more frequently flattened; the calices are much more oblique being like those of *T.* (*?*) *vermicularis* in this respect. The diameter of the corallites is also smaller, being 0·25 mm. in the axial portion and almost 0·5 mm. at the calices. This variety is also very like an undescribed form from Buchan, Victoria, but in the latter the corallites open almost at right angles to the surface.

*Locality:* Por. 73, Par. Copperfield, Clermont. (F. 4039, F. 4044, F 4045, University of Queensland collection.)

### Thamnopora foliata sp. nov.

Pl. II, figs. 1-3.

*Pachypora meridionalis* Richards and Bryan 1924, pl. xvi, fig. 2; non Nicholson and Etheridge 1879.

*Holotype:* F. 4104. University of Queensland collection; from near Oakey Creek, Silverwood, Queensland, Couvinian.

*Diagnosis: Thamnopora,* in the form of thin undulating laminae which may bifurcate. Corallites small and diverging from an undulating surface. Corallite walls greatly dilated except for a narrow zone at the axis. Corallites polygonal to round or slightly elliptical at the axis, round at the periphery. Septa absent. Mural pores small and rare. Tabulae complete, rare.

*Description:* The corallum is in the form of thin laminae, 3 to 6 mm. thick. The laminae are mainly undulating but sometimes take a sharp turn of about a right angle. The laminae may divide dichotomously but, as far as observation of limited material indicates, only rarely. The corallites diverge outwards in both directions from the median surface of the laminae; in the centre of the laminae the corallites run parallel to the median surface, this layer consisting of usually two or three, but sometimes four corallites; these usually turn sharply at right angles so that the calices are only slightly or not at all oblique; in some parts, however, the corallites diverge at an angle as low as 60 degrees to the median surface, and the calices are then oblique. In this median portion of the laminae the corallite walls are thin or slightly dilated. The corallites expand considerably in diameter when they diverge from the axial surface and the walls become greatly dilated. In the undilated axial region the corallites are rounded rarely polygonal or oval, about 0·25 mm. in diameter; at the surface their diameter is about 0·75 mm., but the walls are about 0·2 mm. thick, leaving the lumen about 0·35 mm. in diameter. On the surface or in a tangential section the calices appear as round openings set in the dilatation of the walls. Septa are absent. Mural pores are rare and have only been observed as occasional breaks in the wall in the median portions of cross sections of laminae. Complete horizontal tabulae can occasionally be observed.

*Remarks:* I have had great difficulty in determining the genus to which this form should be referred. In external appearance it agrees very closely with "*Coenites expansus*" de Koninck, and only thin sections show it to be distinct from the latter. The difficulties were increased in two ways—first the loss by fire of the de Koninck's types and the fact that all topotypes of *C. expansus* that I have examined are silicified and badly preserved, and secondly the genus *Coenites* has not been redescribed from thin sections of topotypic material. Eichwald, 1829, created the genus and described two species *C. juniperinus* and *C. intertextus.* He gave a short description and a figure of *C. intertextus;* the genolectotype is *C. juniperinus* (see Bassler 1915, p. 254) topotypic material of which has never been figured. Forms identified as *C. juniperinus* from other localities have been described and figured by several authors; these agree with Eichwald's description in being lamellar and having semi-circular or triangular calices. Lecompte (1933, p. 10, 1939, p. 62) summarised

the earlier work and gives the following diagnosis: "Corallum tabulate branching, lamellae or massive, but in this last case finely zoned. Corallites conical, with very limited development, in consequence of the rapid thickening of the walls, leading to the progressive constriction of the visceral chambers and causing a precocious senility. Calices semilunar or horseshoe shaped. Tabulae few. Mural pores rare. Septa occasionally represented by three processes in the calices." In the absence of a description and figures of the genolectotype I am following Lecompte's diagnosis. It should be noted, however, that this diagnosis excludes such forms as *Coenites seriatopora* (Ed. and H.) (see Oakley 1936, p. 20). On this diagnosis *Coenites* bears a similar relationship to *Alveolites* as does *Thamnopora* to *Favosites,* except that the corallites of *Coenites* are of more restricted development than in *Thamnopora.*

Thus *Thamnopora foliata* is like *Coenites* in its growth form and like *Thamnopora* in all other characters, and I therefore propose to emend the diagnosis of *Thamnopora,* as above p. 45, to include laminar and encrusting forms.

The holotype was figured by Richards and Bryan (1924, pl. xvi, fig. 2) as *Pachypora meridionalis* the identification being made without thin sections and the crystallinity of the limestone obscuring the fact that the corallum is laminar.

*Localities:* Por. 73, Par. Copperfield, Clermont (F. 4037, F. 4038, 4040, 4041, 4042, 4043, Univ. of Q. collection), near Oaky Creek, Silverwood, Q. (F. 4104, Univ. of Q. collection); Limestone Siding, Silverwood, Q. (F. 4356, Univ. of Q. collection).

### Genus Striatopora Hall.

*Striatopora* Hall 1851, p. 400.

*Genotype* (by monotypy): *S. flexuosa* Hall, 1851, p. 400.

*Diagnosis:* Favositidae with the corallites diverging from an axis or a plane at an angle which is at first acute but rapidly increases to, in some species, 90 degrees but in other species considerably less. The walls are undilated in the axial portions but much dilated towards the surface. Septa are absent in the undilated portions but occur in the dilated portions as short lamellae which may break into spines on the axial edges. Neither lamellae nor spines extend beyond the dilated zone. Tabulae and mural pores are present.

*Remarks:* Many species have been ascribed to this genus but few thin sections have been figured, and many species which belong elsewhere have been placed in it. The presence of ridges or of striations in the calices has been taken as an important diagnostic character but few appear to have recognised them as lamellar septa although Lindstrom suggested this (1896, p. 21). The above diagnosis is based on sections of topotypic material of the genotype and topotypic material of *S. halli* Lindstrom. The diagnostic characters have usually been taken to be first oblique much expanded calices and second striations (septal lamellae) in the calyx. These characters are present in *S. flexuosa* the expanded calices being mainly the result of the obliquity of the calices. In sections septal lamellae can be seen in the calices and also occasionally in the dilated parts of the corallites. In *S. halli* the corallites open at right angles to the surface so that the calices are not much expanded, but the corallites increase considerably

in size on diverging from the axis. The corallum is much larger than in *S. flexuosa,* as are the corallites though the calices are smaller; the septal lamellae are longer and more numerous. In both species dilatation of the walls is absent or almost so until the corallites turn towards the surface when it increases very rapidly, nearly filling the corallites.

The expanded cup-shaped nature of the calices with the dilatation and septal striae have generally been taken as the generic characters, but the first of these must be omitted if *S. halli* is to be retained in the genus. In any case it seems to me to be a character more of specific than generic value. Similar expanded calices occur in some species of *Thamnopora.* Thus the essential difference between *Thamnopora* and *Striatopora* is the presence of lamellar septa in the latter. All other characters are essentially the same. Figures of *S. flexuosa* and *S. halli* are included for comparative purposes (Pl. 1, figs. 8, 9).

In both *S. flexuosa* and *S. halli* the trabeculae are holacanthine and strong and thick; in the Clermont species the material is not well enough preserved to allow of determination.

Tripp (1933, pp. 131-2, pl. xvi, figs. 5-7, text figs. 50, 51) described and figured two varieties of *S. halli* from Groganshuvfud, Gotland, in which there is progressively less dilatation and increase in size of the calices. He missed, however, the all-important point that the septal spines have lamellar bases.

Two species from Clermont are doubtfully placed in *Striatopora.* The preservation is such that, in spite of the examination of several sections of each, it is impossible to be certain that septal lamellae are present. It seems probable however that they are present.

### Striatopora? hillae *sp. nov.

* In recognition of Dr. Dorothy Hill's excellent and extensive work on the coral faunas of Australia.

Pl. II, fig. 4.

*Holotype:* The specimen in the collection of the Geological Survey of Queensland H. 101 with two sections from Douglas Creek, Clermont. Upper Couvinian.

*Diagnosis: Striatopora?* with coralla of large diameter and with the corallite walls excessively dilated near the calices, and large, distant, uniserial mural pores.

*Description:* The corallum is up to 4 cm. in length and varies from 8 to 20 mm. in diameter. The coralla are embedded in matrix and branching has not been observed. The corallites are polygonal, but rounded internally by thickening in the peripheral parts, little rounded in the axial; 0·5 to 0·75 mm. in diameter at the axis, expanding rapidly towards the surface of the coralla so that they reach 1 to 1·5 mm. in diameter; they curve away from the axis slightly at first then rapidly so that the calices are only slightly oblique. The dilatation of the corallites is slight in the axial part of the corallum but increases very rapidly towards the calices so that the calices are reduced to one third or less of the diameter of the corallites. Septa are probably represented by short lamellae but no spines are present. The mural pores are large, circular, distant and in one row. The tabulae are thin and complete, about nine in a space of 5 mm.

*Remarks:* Whether this species should be placed in *Striatopora* or *Thamnopora* turns on the presence or absence of septal lamellae. It is unfortunate that the preservation does not allow this to be determined with certainty, but the evidence seems to me to favour their presence. It is remarkable, however, that the lamellae if present do not break into spines on the axial edges. The rapidity with which the dilatation of the corallite walls increases once the corallites have diverged from the axis is a conspicuous feature and in this the species approaches *S. halli,* with which it is also comparable in size of corallum and of corallites. It differs from *S. halli* in not having septal spines and in having one row of large mural pores instead of one or frequently two rows of small pores. I know of no other species with which it is closely comparable.

*Locality:* Por. 73, Par. Copperfield, Clermont. (Univ. of Q. coll. F. 3985); Douglas Creek, Clermont (Geol. Sur. of Q. coll. H. 101).

STRIATOPORA? PLUMOSA† sp. nov.

† *Plumosus, a, um,* feathered, alluding to the frequent plume like appearance of the corallum on natural sections.

Pl. I, fig. 5.

*Holotype:* The specimen F. 3987 (two sections) Univ. of Q. collection, from Por. 73, Par. Copperfield, Clermont. Upper Couvinian.

*Diagnosis: Striatopora?* with coralla of fairly large size, with the corallite walls moderately dilated towards the calices and very short lamellar septa breaking into spines on the axial edge. Mural pores are rare but large and uniserial. The tabulae are complete and fairly numerous.

*Description:* Coralla up to 3 cm. in length and 1 cm. in diameter have been observed though smaller than these dimensions are more common. The diameter of the corallites is 0·5 to 0·75 mm. and the walls are slightly dilated in the axial portion and moderately dilated in the peripheral portion. The crystalline and muddy nature of the matrix makes the observation of the type of septa difficult. Septal spines are undoubtedly present and numerous, and while the evidence is not conclusive, it seems almost certain that the spines have very short lamellar bases. The tabulae are complete, horizontal or concave about 15 in 5 mm.

*Remarks:* As with *Striatopora? hillae* there is difficulty in deciding whether this species should be placed in *Striatopora.* With the poor state of preservation it is impossible to be certain whether or not the septa have lamellar bases but the balance of evidence is that very short lamellar bases are present and it is therefore doubtfully placed in *Striatopora.* Both *S? hillae* and *S? plumosa* are larger than most species of the genus although smaller than *S. halli.* In *S.? plumosa* the corallite walls are much less dilated than usual.

*Locality:* Por. 73, Par. Copperfield, Clermont. University of Q. collection, F. 3987. F. 3988 (each specimen consists of a dozen or more coralla). Upper Couvinian.

Genus GEPHUROPORA Etheridge.

non *Columnopora* Nicholson 1874, 1875 (a), (b), 1879 which he later stated to be *Calapoecia* Billings.

*Columnopora* (*Gephuropora*) *Etheridge* 1920, pp. 2-6, pls. xiv, xv.
*Columnopora* Lecompte 1939, p. 95.

*Genotype:* (by monotypy) *G. duni,* Etheridge, 1920, p. 6, pls. xiv, xv, from the Devonian of Cavan, N.S.W.

*Diagnosis:* Tabulate corals in which small longitudinal tabulate tubules occur in some of the corners of the corallites and more rarely in the common wall of two corallites. The septa are spinose but probably have short lamellar bases. Mural pores are present.

*Remarks:* The Australian material is sufficiently well preserved to show the larger structures, such as septa, well, but insufficiently so to show definitely the microscopic structure of the skeleton. Thus the determination of the relationships of *Gephuropora* is exceedingly difficult.

Billings, 1865, proposed *Calapoecia* for three Ordovician species of Canadian corals but gave no figures. Nicholson, 1874, proposed Columnopora for certain Ordovician Canadian corals and later, 1875 (a), (b), 1879, described and figured these again, but in 1889 after an examination of some of Billings's material he agreed that they are congeneric. Rominger in 1876 (see Lang, Smith and Thomas, p. 231) distributed page proofs of his 1876 [?1877] work, proposing *Houghtonia*, genotype *H. huronica*, but in the completed work, 1876 [?1877] he noted this to be a synonym of *Columnopora* Nicholson. Etheridge, 1920, thought *Gephuropora* to be closely allied to, if not identical with, *Columnopora* Nicholson. Lecompte, 1939, described three species from the Couvinian of the Ardennes which he referred to *Columnopora* Nicholson. He does not discuss its relationship to *Calapoecia* Billings and had not apparently seen Cox's, 1936, revision of that genus. These three species are here regarded as congeneric with *Gephuropora*.

*Gephuropora* appears at first sight very like a massive *Favosites* but the presence of tubules in the angles and sides of the corallites at once distinguishes it. The corallites are polygonal like those of a *Favosites* and the young corallites when they appear are three or four sided, the sides rarely being slightly curved, with the concavity towards the interior of the young corallite. In longitudinal sections where a corallite wall is cut tangentially it presents an aspect unusual in the Favositidae; little work has been done on the microscopic skeletal structure of the Favositidae but from limited observations of my own, it appears that the epitheca consists of a narrow zone of fibres which diverge from the median dark line. These fibres may be continuations of the fibres of septal trabeculae or may be independant of any trabeculae. No observations have been made to show that a granular layer is present as in the epitheca of simple and possibly some compound Rugosa. When a longitudinal section is tangential to the wall these fibres appear in cross section as a multitude of minute dots giving a uniform texture, interrupted, if septal spines are present by much larger circular dots with a fibrous radial structure. Thus each septal spine appears to consist of one trabecula. In *Gephuropora* the wall, while having the uniform texture and, in parts, cross sections of septal spines, is in other parts disconnectedly streaky in a longitudinal direction as in most Rugosa. In the Rugosa the streaky appearance is due to the trabeculae of the septa being so close together (or alternately the fibres of the trabeculae so long) that the fibres of adjacent trabeculae unite forming a continuous vertical plate, the streaks in the section being the bases of these plates. In *Gephuropora* there are two possible explanations. First the individual trabeculae forming the septal spines may assume a vertical or almost vertical direction on meeting the wall and continue downwards in the wall for some distance; or second the septa may consist of a very narrow lamellar portion in which inclined trabeculae are in contact, with either some of the trabeculae projecting beyond the

lamellar portion forming spines or else on the axial edges of the lamellae the radiating fibres of the trabeculae are shorter than those in the lamellar portions so that spines are formed. In the first case there would be discontinuous lamellar bases to the septa, each such lamellar base consisting of one, more or less vertical but probably compound trabecula; in the second the longitudinal streaks would consist of oblique sections of trabeculae in contact.

The longitudinal streaks are so close together that it seems that the trabeculae in the lamellar bases must be compound. Better preserved material is required before more definite statements can be made on this subject. Lecompte, 1939, did not recognise lamellar septa in his species. Nicholson, 1874, Lambe, 1899, and Cox, 1936, all describe the septa of *Calapoecia* as being short lamellae, spinose on the inner edge. The only other Favositidae in which I have observed this wall structure is in those with lamellar septa as *Angopora* Jones, 1936, *Striatopora* Hall and in *Favosites goldfussi* d'Orb. from the Eifel. The wall of Silurian species of *Favosites* never in my experience shows this structure. Whether or not it is general in Devonian species I am unable to say, as of the Devonian material at my disposal only that from the Eifel is well enough preserved to show the structure of the wall. The septal spines of *Gephuropora* are conical in shape with a broad base and sharply pointed, sometimes directed slightly upward. This description applies equally to the spines in *Calapoecia* but in the latter the septa are "typically twenty" (Cox 1926, diagnosis p. 2). Cox also says, p. 2: "The writer is able to state that in all the specimens of this genus he has examined the number of septa is constantly twenty" (this is the case in the one specimen of which I have thin sections) whereas in *Gephuropora* it is not possible to state how many septa there are in a cycle because they are very sporadically distributed as in *Favosites*. Thus parts of some sections, both transverse and longitudinal, of *Gephuropora* as is also the case in *Favosites* (except those with long and abundant septa) show no septa at all. Rarely in *Gephuropora* lamellar septa are suggested in transverse section by the wall appearing like a string of beads as in *Angopora*. In *Calapoecia*, as Cox states, the lamellar bases of the septa can be seen in sections and as ridges in weathered specimens.

Cox, 1936, examined a large number of specimens of *Calapoecia* including Billings's and Nicholson's material and he says there is "no true wall and the corallites are bounded by an open lattice work of septal elements, recognisable in either longitudinal or transverse sections by the radiation of fibres which constitute them" (p. 8), and "consequently the corallite boundary must be considered as a cribriform stereozone" (p. 21). In the Rugosa a tangential section of the epitheca shows, between the trabeculae which are the bases of the septa, innumerable cross sections of the minute fibres normal either to the median dark line or the dissepiments; this is the case also in *Favosites* (except possibly *F. goldfussi*), but in *Calapoecia* the fibres of adjacent trabeculae do not meet except at regular intervals where the septal lamella give rise to spines with so broad a base that they usually unite laterally forming cross bars. The spaces bounded by these cross bars and the septal lamellae are the "mural pores." Thus the "mural pores" in *Calapoecia* are spaces between the septal elements; in *Favosites* they are holes piercing the wall fibres. The material of *Gephuropora* and *F. goldfussi* is not good enough to determine if there are fibres between the trabeculae (if such they be) or not, but in any case the mural pores pierce the

trabeculae and any fibres which exist between them. Further in *Calapoecia* the "mural pores" pierce a median stereozone (see Jones and Hill 1940, footnote p. 194), whereas in *Favosites* and *Gephuropora* the mural pores pierce the epitheca. Thus the "mural pores" of *Calapoecia* are not a structure analogous to the mural pores of *Gephuropora* and *Favosites.*

Cox found a continuous gradation between *Calapoecia canadensis* with the corallites in contact and no "coenenchyme" to *C. anticostiensis* with circular corallites, "costae" and a "coenenchyme" of tabulae. The question arises whether the tubules of *Gephuropora* represent the "coenenchyme" of *Calapoecia.* At first sight this appears probable especially as two af Nicholson's figures (1879, pl. vii, figs. 2a, 2b) are very like transverse sections of *Gephuropora,* except that they show tubules not only piercing the median dark line of the walls but also "accompanied by smaller rounded and definite vacuities (Pl. vii, fig. 2b) which are situated in the substance of the walls themselves." This has not been observed in any transverse sections of *Gephuropora* (although the tubules are not invariably right in the centre of the wall), but in one instance in a longitudinal section a tubule after following the median line of the wall for some distance diverged from it for a short distance. In *Gephuropora* the tubules have tabulae at distant and irregular intervals. Etheridge says of the tubules (p. 4) "the walls of these circular bodies are identical in structure with the primordial walls of the corallites, and also have a stereoplasmic thickening." This is strongly supported though not definitely proved by my own observations. There is also some evidence of mural pores piercing the walls of tubules. It appears then almost certain that the tubules of *Gephuropora* were occupied by coral tissue.

Cox, 1936, examined Nicholson's specimens of *Columnopora* and agreed with Nicholson and Lambe that it is identical with *Calapoecia,* placing *Columnopora cribriformis* Nicholson as a synonym of *Calapoecia canadensis,* i.e. *Calapoecia* with no "coenenchyme." He says the "intramural vacuities" (i.e. the "intramural canals" of Nicholson resembling according to Nicholson's figures, the tubules of *Gephuropora*) in Nicholson's material and his own material of *C. canadensis* do not always occur in the wall but usually near it; they are in longitudinal section circular to inflated vermiform, and *show no structure.* He thinks they may be due to some boring animal. If Cox's interpretation is correct then the tubules of *Gephuropora* cannot be the same as the "intramural vacuities" of *Calapoecia canadensis* but they may still be a much reduced "coenenchyme" like that in *C. anticostiensis,* but the evidence is that the wall of *Gephuropora* has a structure like that of *Angopora* or a "*Favosites*" with lamellar bases to the septal spines and must therefore be regarded as an epitheca not as a cribriform stereozone such as that of *Calapoecia. Gephuropora* must therefore be regarded as distinct from *Calapoecia.* The tubules of the three species described by Lecompte have tabulae so that they may be regarded as congeneric with *Gephuropora.*

GEPHUROPORA DUNI Etheridge.

Pl. II, fig. 6; pl. III, figs. 1-4.

*Gephuropora duni* R. Etheridge jun. 1920 pp. 2-6, pls. xiv, xv.

*Holotype:* Etheridge's material was probably in the Mining Museum, Sydney, but cannot be traced. The horizon of his material is uncertain but the species is interpreted upon specimens some of which are probably topotypes.

*Diagnosis:* *Gephuropora* in which the corallites are large, septal spines irregularly developed and tubules very irregularly distributed and variable in size.

*Description:* The external form of the corallum is unknown as only fragments have been found, but it was massive and probably the corallites radiated from a point. The corallites are usually of two orders of size, the larger being about 2 mm. in diameter and the smaller 1·5 mm. The corallites are polygonal but may be rounded by thickening, the walls being moderately thin to thick. The wall wherever cut tangentially has a streaky appearance suggesting trabeculae and lamellar bases to the septa. The septal spines are very variable in development, some parts of a corallum being almost free while other parts show many spines. In form they are usually short blunt spines with a broad base and occur at the same level in contiguous corallites; but longer sharp spines occur in parts and they may alternate in contiguous corallites. The mural pores are large and numerous, typically in two rows which may, but usually do not, alternate, sometimes in one or three rows. The tabulae are usually regular, rarely incomplete, horizontal, inclined or flexuous, usually about 12 in 5 mm., but there may be as many as 22. The tubules vary in number in different parts of the same corallum and in different coralla. They occur more frequently in the angles but also in the sides. They are circular and in size vary from 0·2 mm. to 0·5 mm. Tabulae are rarely and irregularily developed in the tubules.

*Remarks:* The above description is based on specimens from Clermont, Cavan and Buchan. There is considerable variation from specimen to specimen but so much variation occurs in individual specimens that I consider they are best treated as one variable species. The Clermont specimens are moderately thin walled, while most of the Cavan specimens are thick walled but one is quite thin walled. The Buchan specimen is thin in one part but thick in another. The variation in the development of septa is similar. The Buchan specimen was previously recorded by the writer, 1937, p. 98, as *Favosites multitabulata* Jones. This error was due to the fact that no tubules appear in the transverse part of the section while the few which show in one part only of the longitudinal were mistaken for cavities caused by some boring animal. *F. multitabulata* is not known to exist at Buchan.

Of the three species described by Lecompte from the Bassin du Dinant, *G. duni* is closest to *"Columnopora" maillieuxi* but differs in having smaller corallites, tubules in the walls of the corallites as well as the angles, more septa, more mural pores and more numerous tabulae.

*Localities:* Por. 73, Par. Copperfield, Clermont, Queensland, F. 3959-62 (Univ. of Q. collection). Other specimens studied are from the Limestone near the Yass end of the Taemas Bridge, Cavan, N.S.W., the "Currajong" limestone 0·7 miles from the Taemas Bridge towards Wee Jasper, the "Bluff limestone 0·5 miles from the Taemas Bridge towards Wee Jasper, Cavan, N.S.W. (Lower Middle Devonian). Lecompte's species came from the Lower and Upper Couvinian, *"Columnopora" maillieuxi* being from the Upper Couvinian.

## Genus Scoliopora Lang, Smith and Thomas.

*Alveolites* Milne-Edwards and Haime 1851, p. 258, pars.
*Plagiopora* Gurich 1896, p. 143.
*Plagiopora Lecompte* 1939, p. 139.
*Scoliopora* Lang, Smith and Thomas 1940, pp. 101, 118.

*Genotype: Alveolites denticulatus* Milne-Edwards and Haime, 1851, p. 258, pl. xvi, fig. 4. Devonian, Bensberg, Westphalia, Germany.

*Diagnosis* (as given by Lecompte): Tabulate coral, branching or lamellar, with calices furnished with one to three spiniform projections generally elongated transversely and opening perpendicularly to the surface. Walls thickened distally. Mural pores numerous. Tabulae distant in the axis of the colonies, crowded outside them. Increase by fission.

*Remarks:* This genus was founded by Gurich, 1896, for two species —*Alveolites denticulatus* Ed. and H. 1851, p. 258, and *Plagiopora dziwkiensis* n. sp. Gurich gave a short diagnosis. The genus is apparently rare and until Lecompte, 1939, no author has described the genus in detail though Gurich, 1909, Lebedew, 1902, Cowper Reed, 1908 and 1922, Sobolew, 1909, and Lecompte, 1939, recorded species.

Lecompte, 1939, describes the genus, three species and a variety, in detail with figures of thin sections. He was unable to find the holotype of *A. denticulatus* Ed. and H. in the Verneuil collection nor were thin sections of topotypes existing in that collection available. Nevertheless there appears little doubt that Lecompte's material belongs to this genus. In his diagnosis Lecompte indicates that the thickening of the walls increases distally but shows in his description of the species that this character varies, thus in *S. kaisini* he says (p. 145) "Parois peu épaisses, a renflenment distal nul ou peu accentué."

Lang, Smith and Thomas, 1940, point out that *Plagiopora* is preoccupied for a Tertiary Polyzoan and propose the name *Scoliopora* in its place.

SCOLIOPORA FLEXA* sp. nov.

* flexus—winding.

Pl. III, fig. 5.

*Holotype:* Specimen in the collection of the Geological Survey of Queensland, 66, from the Lower Middle Devonian of Douglas Creek, Clermont.

*Diagnosis:* Lamellar, encrusting *Scoliopora,* with the corallite walls uniformly thickened throughout their length or with a slight increase of thickening distally. Calices circular or meandrine rarely kidney shaped. Mural pores rare, circular, in one row. Tabulae thin, complete predominating, rarely incomplete and inosculating.

*Description:* The external form is difficult to discern as the corallum is embedded in limestone. It is probably lamellar and encrusting with the corallites frequently changing their direction of growth so that one surface may present both transverse and longitudinal sections of corallites. The walls of the corallites are usually thickened uniformly throughout their length, but rarely there is an increase in thickening distally. The thickness ranges from 0·12 mm. to 0·75 mm. The calices open perpendicularly to the surface, are circular, oval, meandrine or occasionally kidney shaped. The diameter of the circular calices ranges from 0·25 mm. to 0·4 mm., while the meandrine ones may be as long as 2·5 mm. and as wide as 1 mm. The dilatation of the walls frequently reduces the width of the lumen to half or less than half the width of the corallites. Septa are absent. A thick spiniform projection occasionally present. The mural pores appear in only one place in three sections where they are small circular and apparently in one row. The tabulae are thin and nearly always complete though odd ones are incomplete and inosculating.

*Remarks:* Only one specimen of this species has been found at Clermont. There is some slight doubt in my mind as to whether it should be referred to *Scoliopora*. *Scoliopora* as interpreted and illustrated by Lecompte has calices mostly shaped like those of *Coenites*, whereas in *flexa* the calices are mostly circular or meandrine. Further the species of *Scoliopora* described by Lecompte have one to three spines well developed but in *flexa* it is only rarely that a spine is seen. Mural pores are much more numerous in the species described by Lecompte.

Lecompte's species are from the Givetian and Frasnian.

*Locality:* Douglas Creek, Clermont (Geol. Surv. Qld. 66).

Family SYRINGOPORIDAE.

Genus SYRINGOPORA Goldfuss.

*Syringopora* Goldfuss, 1826, p. 75.

*Genotype: S. ramulosa* Goldfuss, Carboniferous, Olne, near Limber, Germany.

SYRINGOPORA cf. SPELAEANUS Etheridge.

Pl. III, fig. 6.

*Syringopora spelaeanus* Etheridge, 1902, p. 258. Pls. xxxvii, fig. 2, pl. xxxviii.

*Remarks:* One poorly preserved specimen which is probably *S. spelaeanus* is in the Geological Survey of Queensland collection (66). Etheridge described, and figured externals of this species from Cave Flat, Murrumbidgee R., and I have examined thin sections of a specimen collected by Miss Hill from the same horizon at Wee Jasper which agree well with Etheridge's description. The Clermont specimen is highly crystalline but the size, appearance and what little can be seen of internal structure agree with the Murrumbidgee material.

The specimen from Wee Jasper and Etheridge's description of the Cave Flat specimens suggest a relationship of *S. spelaeanus* to *S. eifeliensis* Schluter, 1889, p. 167, pl. xv, figs. 1-5. The size is similar but while *S. spelaeanus* has very short lamellar septa broken into spines on the axial edge, *S. eifeliensis*, judging by Schluter's description and figure (Pl. xv, fig 5) has spines alternating with short lamellae, so that it is possibly a Rugose coral, minor septa being unknown in the Tabulata. (Etheridge did not mention the lamellar septa of *S. spelaeanus* apparently not having examined thin sections. Etheridge compares the species with *S. abdita* de Verneuil (Edwards and Haime 1851. p. 295, pl. 15, fig. 4) but points out that the latter has many fewer septa. Lecompte (1939, p. 168) records a slightly smaller form as *S. eifeliensis* Schluter from the Upper Givetian but says it has no septa, being thus distinguished from *S. abdita* de Verneuil.

*Locality:* Douglas Creek, Clermont, por. 73, Par. Copperfield, Geol. Surv. Q. 66.

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R.S.—G.

## BIBLIOGRAPHY.


BASSLER, R. S., 1915. "Bibliographic Index of American Ordovician and Silurian Fossils." Bull. U.S. Nat Mus., XCII (1), pp. viii + 1-718; (2) pp. iv + 719-1521, pls. I-IV.

BILLINGS, E., 1865. "Notice of some new genera and species of Palaeozoic Fossils." Can. Nat. and Geol., N.S., 11.

DE BLAINVILLE, H. M. D., 1830. Article Zoophytes in "Dictionaire des Sciences Naturelle," Vol. lx, pp. 1-546.

BRYAN, W. H., and HILL, D., 1941. "Spherulitic Crystallisation as a Mechanism of Skeletal Growth in the Hexacorals." Proc. Roy. Soc. Qld.

CHAPMAN, F., 1914. "Newer Silurian Fossils of Eastern Victoria." Parts III. Recs. Geol. Surv. Vict., iii., pp. 301-316, pls. xlvi-lxi.

COX, I., 1936. "Revision of the Genus *Calapoecia* Billings." Nat. Mus. Canada, Bull. No. 80, Geological Series No. 53.

EICHWALD, C. E. VON, 1829. "Zoologia Specialis . . ." I, pp. vi + 1-314, pls. i-v Vilna.

ETHERIDGE, R., 1892. In Jack & Etheridge, "Geology and Palaeontology of Queensland and New Guinea." Brisbane, 1892.

ETHERIDGE, R., 1899. "Descriptions of New or Little Known Victorian Palaeozoic and Mesozoic Fossils No. 1." Prog. Rept. Geol. Surv. Victoria, No. XI.

ETHERIDGE, R., 1902. "Additions to the Middle Devonian and Carboniferous Corals in the Australian Museum." Rec. Aust. Mus., Vol. IV, No. 7, pp. 253-262, pls. xxxvii-xl.

ETHERIDGE, R., 1920. "Further Additions to the Coral Fauna of the Devonian and Silurian of New South Wales . . ." Rec. Geol. Surv. N.S.W., Vol. ix, pt. 2, pp. 55-63, pls. XIII-XV.

FRECH, F., 1886. "Die Cyathophylliden und Zaphrentiden des deutschen Mitteldevon . . ." Pal. Abhand., 3, Heft. 3, pp. 117-233, pl. XIII-XX.

GOLDFUSS, G. A., 1826-1833. "Petrefacta Germaniae," 1, pp. 1-76, pls. i-xxv (1826); pp. 77-164, pls. xxvi-l (1829); pp. 165-240, pls. li-lxxi (1831), pp. 241-252 (1833). Düsseldorf.

GURICH, G., 1896. "Das Palaeozoicum im Polnischen Mittelgebirge," Verhandl. der Russisch-Kais. Mineral Gesellschaft, zu St. Petersbourg. Zweite Serie, 32, 539 pp., 39 pl.

GURICH, G., 1909. "Leitfossilien . . ." Zweite Lieferung: Devon. pp. 97-199. Taf. 29-52. Berlin 1909.

HALL, J., 1851. "New Genera of Fossil Corals from the Report by James Hall, on the Palaeontology of New York." Amer. Jour. Sci., (2), XI, pp. 398-401.

HILL, D., 1936. "Upper Devonian Corals from Western Australia." Jour. Roy. Soc. W.A., Vol. XXII, pp. 25-38, pl. 1..

HILL, D., 1937. "The Permian Corals of Western Australia." Jour. Roy. Soc. W.A., Vol. XXIII, 1937, pp. 43-63, pl. 1, text figs. 3-11.

HILL, D., 1938. "The Devonian Rugose Corals of Lilydale and Loyola, Victoria." Proc. Roy. Soc., Vict., Vol. LI, pt. 11, N.S.

HILL, D., 1939 (*a*). "The Middle Devonian Corals of Queensland, I. Douglas Creek and Drummond Creek, Clermont District." Proc. Roy. Soc. Q., Vol. L, No. 10, pp. 55-65, pls. IV-V, June 1939.

HILL, D., 1939 (*b*). "Western Australian Devonian Corals in the Wade Collection." Jour. Roy. Soc. W.A., Vol. XXV, pp. 141-149, plate 1.

HILL, D., and JONES, O. A., 1940. "The Corals of the Garra Beds, Molong District, New South Wales." Proc. Roy. Soc. N.S.W. Vol. LXXIV, pp. 175-208, pls. II-VII.

JONES, O. A., 1936. "The Controlling Effect of Environment upon the Corallum in Favosites, with a revision of some Massive Species on this Basis." Ann. Mag. Nat. Hist., Ser. 10, vol. xvii, pp. 1-24, pls. i-iii; January 1936.

JONES, O. A., 1937. "The Australian Massive Species of the Coral Genus Favosites." Rec. Aust. Mus., Vol. XVII, pp. 1-24, pl. i-iii.

JONES, O. A., and HILL, D., 1940. "The Heliolitidae of Australia, with a discussion of the Morphology and Systematic Position of the Family." Proc. Roy. Soc. Q. Vol. LI, No. 12, pp. 183-215, pls. vi-xi.

DE KONINCK, L. G., 1876. "Recherches sur les Fossiles Paleozoiques de la Nouvelles-Gelles du Sud (Australie)." pp. 373, 8vo Atlas, pls. I-IV, 1876, pls. V-XXIV, 1877.

LAMARCK, J. B. P. A. DE M. DE, 1801. "Systeme des Animaux sans Vertebres . . ." pp. viii + 1-432, Paris.

LAMARCK, J. B. P. A. DE M. DE, 1816 "Histoire naturelle des Animaux sans Vertebres," 11, pp. 1-568. Paris.

LAMBE, L. M., 1899. "Contributions to Canadian Palaeontology." Vol. IV., Pt. 1, pp. 1-96, Pls. I-V, Geol. Surv. Canada.

LANG, W. D., SMITH, S., and THOMAS, H. D., 1940. "Index of Palaeozoic Coral Genera." British Museum (Nat. Hist), pp. v + 231.

LEBEDEW, N., 1902. "Die Bedeutung der Korallen in den devonischen Ablagerung Russlands." Mem. Com. Geol., XVII, No. 2, 180 pp., 5 pls.

LECOMPTE, M., 1933. "Le Genre Alveolites Lamarck . . ." Mem. Mus. Roy. d'Hist. Nat. de Belgique, No. 55, pp. 1-49, pls. i-iv.

LECOMPTE, M., 1936. "Revision des Tabules Devoniens Decrits par Goldfuss." Mem. Mus. Roy. d'Hist. Nat. de Belgique, No. 75, pp. 1-111, pls. I-XIV.

LECOMPTE, M., 1939. "Les Tabules du Devonien Moyen et Superieur du Bord Sud du Bassin de Dinant." Mem. du Musee Royal d'Histoire Naturelle de Belgique, Mem. No. 90, pp. 1-227, pls. I-XXIII.

LINDSTROM, G., 1873. "Nagra Anteckningar om Anthozoa tabulata." Kongl. Vetens-Akad. Firhandl. 1873, No. 4, pp. 3-20.

LINDSTROM, G., 1896. "Beschreibung einiger obesilurische Korallen von der Insel Gotland." Bihang. Till k. Svenska Vet. Akad. Handlingar Bd. 21, Afd. IV. No. 7, pp. 23-32.

MILNE-EDWARDS, H., and HAIME, J., 1851. "Mon. Pol. Terr. Pal." Arch. Mus. d'Hist. Nat. V, 502, pp., 20 pl.

NICHOLSON, H. A., 1874. "On Columnopora, a New Genus of Tabulate Corals." Geol. Mag. New Series, Vol. 11, pp. 253-4.

NICHOLSON, H. A., 1875 (*a*). "Descriptions of the Corals of the Silurian and Devonian Systems." Rept. Geol. Surv. Ohio, 11, Geol. and Pal., pt. 11, Pal.

NICHOLSON, H. A., 1875 (*b*). Rept. Pal. Province of Ontario, Pt. 11.

NICHOLSON, H. A., 1879. "On the Structure and Affinities of the Tabulate Corals of the Palaeozoic Period." Edinburgh.

NICHOLSON, H. A., 1889, in Nicholson and Lydekker. "A Manual of Palaeontology." Vol. 1, Third edition. Edinburgh and London.

NICHOLSON, H. A., and ETHERIDGE, R., 1879. "Description of Palaeozoic Corals from Northern Queensland." Ann. Mag. Nat. Hist., September 1879.

OAKLEY, K. P., 1936. "On the Wenlock Coral *Coenites seriotopora* (H. M. Edwards and J. Haime)." Summary of Progress of the Geological Survey for 1934, Pt. 11, pp. 20-27, pl. iii.

d'ORBIGNY, A., 1850. "Prodrome de Paleontologie . . ." Paris.

REED, F. R. C., 1908. "The Devonian Forms of the Northern Shan States." Mem. Geol. Surv. India. Pal. Indica, N.S. II, 5, 183 pp., 20 pl.

REED, F. R. C., 1922. "Devonian Fossils from the Chitral and the Pamirs." Mem. Geol. Surv. India, Pal. Indica, N.S. Vol. VI, No. 2, pp. V + 132, 16 pl.

RICHARDS, H. C., and BRYAN, W. H., 1924. "The Geology of the Silverwood-Lucky Valley Area." Preprint issued August 1924, pp. 44-100, pls. VII-XX of Proc. Roy Soc. Q. Vol. XXXVI, No. 6 for 1924, issued Feb. 1925.

ROMINGER, C., 1876 [? 1877]. "Palaeontology. Fossil Corals." Geol. Surv. Michigan, 111, (2) pp. 1-161, pls. I-IV.

SCHLUTER, C., 1889. "Anthozoen des rheinischen Mittel Devon. Abhandl. zur. geol. specialkarte von Preussenfund den Thuringischen Staaten. Bd. viii, Hft. 4.

SMITH, S., 1933. "Sur des especes nouvelles d'Alveolites . . ." Ann. Soc. Geol. du Nord., T. LVII, pp. 134-143, pls. ii, iii.

SMITH, S., and GULLICK, B., 1925. "The Genera *Favosites* and *Emmonsia* and the species *Emmonsia parasitiva* (Phillips)." Ann. Mag. Nat. Hist. (9), 15, pp. 116-126, pl. VIII.

SOBOLEW, D., 1909. Mittel-Devon des Kielce-Sandomir-Gebirges. Materialen zur Geologie Russlands. Hergaus-gegeben von der Kayserl. Miner. Gessells. Bd. XXIV., pp. 41-536, pl. II-VI.

STEININGER, J., 1831. "Bemerkungen über die Verspeinerungen Welche in dem Uebergangs-Kalkgebirge der Eifel gefunden werden." p. 44. Trier.

TRIPP, K., 1933. "Die Favositen Gotlands." Palaeontographica Beitrage zur Naturgeschichte der vorzeit. Bd. LXXIX, Abt. A.

## EXPLANATION OF PLATES.

All figures by approximately 2 diameters unless otherwise stated.

### Plate I.

*Favosites bryani* Jones p. 42.

Fig. 1.—F. 3964, University of Queensland. Douglas Creek, Clermont.

*Favosites nitidus* Chapman p. 43.

Fig. 2.—F. 3968, University of Queensland. Por. 73, Par Copperfield. 2a, transverse section, 2b longitudinal.

*Alveolites suborbicularis* Lamarck p. 44.

Fig. 3.—F. 3959, University of Queensland. Por. 73, Par Copperfield. 3a, transverse, 3b longitudinal section.

*Thamnopora meridionalis* (Nich. and Eth.) p. 46.

Fig. 4.—F. 4613, University of Queensland. Weathered surface showing type of branching. Slightly reduced.

Fig. 5.—Section $D_3$. Geological Survey of Queensland. Arthur's Creek, Burdekin Downs, Queensland. Transverse section of a branch.

Fig. 6.—Section $D_6$ Geological Survey of Queensland. Arthur's Creek, Burdekin Downs, Queensland. Axial section of a branch.

*Thamnopora meridionalis* (Nich. and Eth.) var. *minor* var. nov. p. 47.

Fig. 7.—F. 4045, University of Queensland. Por. 73, Par. Copperfield. 7a. Tangential, 7b. axial section of a branch.

*Striatopora flexuosa* Hall, p. 49.

Fig. 8.—British Museum, R. 28492. Topotype. Lockport, N.Y. 8a. Section across a branch, 8b. axial section.

*Striatopora halli,* Lindstrom p. 49.

Fig. 9.—F. 5341, (University of Queensland). Gustavsvik, Gotland.

### Plate II.

*Thamnopora foliata* sp. nov. p. 48.

Fig. 1.—F. 4104, University of Queensland. Limestone Siding, Silverwood. Holotype.

Fig. 2.—F. 4042, University of Queensland. Por. 73, Par. Copperfield. Tangential section.

Fig. 3.—F. 4038, University of Queensland. Por. 73, Par. Copperfield. Axial section of a bifurcating lamina.

*Striatopora? hillae* sp. nov. p. 50.

Fig. 4.—H. 101, Geological Survey of Queensland. Douglas Creek, Clermont. Holotype. 4a. Transverse section, 4b. axial section.

*Striatopora? plumosa* sp. nov. p. 51.

Fig. 5.—F. 3987, University of Queensland. Por. 73, Par Copperfield. Section of the Holotype.

*Gephuropora duni* Etheridge p. 54.

Fig. 6.—F. 4612, University of Queensland. Yass end of Taemas Bridge. Transverse section showing fairly thin wall and tubules and few septa.

### Plate III.

*Gephuropora duni* Etheridge p. 54.

Fig. 1.—F. 4612, University of Queensland. Yass end of Taemas Bridge. Longitudinal section showing septa, relatively thin walls and tubules.

Fig. 2.—F. 4611, University of Queensland. Yass end of Taemas Bridge. Showing thicker walls. 2a. Transverse, 2b. longitudinal section.

Fig. 3.—F. 3961, University of Queensland. Por. 73, Par Copperfield. Showing few tubules and no septa. 3a. Transverse section, 3b. longitudinal section.

Fig. 4.—F. 3960, University of Queensland. Por. 73, Par Copperfield. Showing few tubules and well developed septa. 4a. Transverse, 4b. longitudinal section.

*Scoliopora flexa* sp. nov. p. 56.

Fig. 5.—No. 66, Geological Survey of Queensland. Douglas Creek, Clermont. Holotype. 5a, Transverse, 5b. longitudinal section.

*Syringopora* cf. *spelaeanus* Etheridge p. 57.

Fig. 6.—No. 66, Geological Survey of Queensland. Douglas Creek, Clermont. Transverse section.